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2014

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citation for published version (APA)

Pereboom, M. T. R. (2014). *The role of clients, midwives and health policy in preventing infectious diseases during pregnancy: Toxoplasmosis, Listeriosis. Cytomegalovirus & Chlamydia trachomatis*. [PhD-Thesis - Research and graduation internal, Vrije Universiteit Amsterdam].

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Chapter 4

Maternal cytomegalovirus infection prevention: The role of Dutch primary care midwives

Midwifery 2014

E-pub May 1

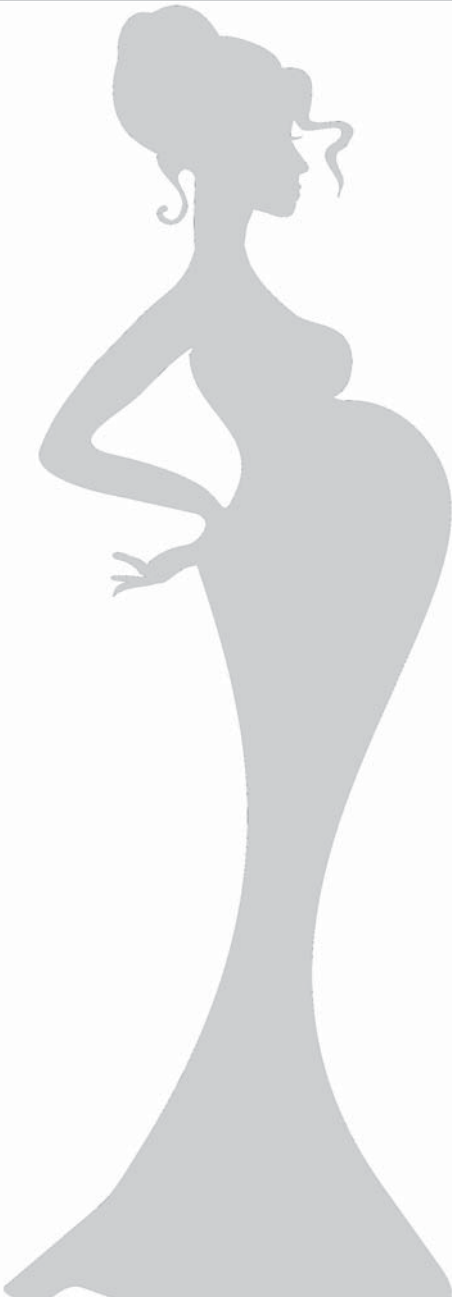
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Abstract

Objective: to assess the knowledge of cytomegalovirus (CMV) infection among Dutch primary care midwives, and clinical approaches to informing women about CMV.

Design: cross-sectional study, using self-administered questionnaires.

Participants: 330 Dutch primary care midwives.

Setting: primary midwifery care practices across the Netherlands.

Main outcome: Midwives' knowledge of CMV transmission routes and maternal symptoms, and clinical practice behaviours regarding CMV, the information typically provided or reasons for not informing pregnant women about CMV.

Findings: the overall median knowledge score was 8.0 out of a maximum possible score of 13.0. Of all participants, 10.6% reported always informing pregnant women about CMV infection prevention and 41.0% reported never informing pregnant women. The main reason indicated for not informing pregnant women was lack of knowledge about preventive methods (45.7%).

Conclusion: Dutch primary care midwives have limited knowledge of CMV infection. Improvement in providing education to pregnant women about strategies to prevent CMV is necessary.

Background

Cytomegalovirus (CMV) infection is one of the most common viral infections during pregnancy, and congenital CMV infection is a common cause of birth defects and developmental disabilities, such as hearing impairment and developmental delay (1-3). The estimated birth prevalence of congenital CMV is 0.64% worldwide (1). In the Netherlands, the estimated birth prevalence of CMV is 0.54%, which translates to approximately 1000 infants infected with congenital CMV infection annually (2); this equals the prevalence rate of Down syndrome (1, 4).

Approximately 10–15% of the live-born infants with congenital CMV infection have signs and symptoms at birth, and an additional 15–20% of the infected newborns develop symptoms later in life (1, 2). Thus CMV infection in pregnant women is an important, albeit perhaps an under-recognised public health problem.

Currently, there are no vaccines or treatment options available to prevent CMV infection; therefore it is important to provide pregnant women with information on CMV infection prevention methods. And although it is difficult to investigate the exact impact of hygienic interventions (such as frequent hand washing after contact with saliva or urine of infants and young children) on reducing the risk of maternal CMV infection, studies consistently show that education on hygienic behaviour can significantly reduce the risk of acquiring maternal CMV infection, and that pregnant women are often highly motivated to change their behaviour for the safety of their unborn baby (5-10). However, many health care providers involved in mother and childcare do not counsel their patients about CMV infection prevention (11), and written educational materials on CMV infection prevention for pregnant women in the Netherlands are scarce. As a consequence, most pregnant women have not heard about the risk of CMV infections and they do not know how to prevent the infection (3, 12-15).

Midwives are important in providing preventive counselling, as most pregnant women start their antenatal care in primary midwifery care in the Netherlands (16). To our knowledge there is only one Dutch study among doctors involved in mother and childcare that assessed knowledge of CMV infection in pregnancy, but this study did not include midwives (17). In addition, no studies have explored why some health care providers do not inform pregnant women about methods to prevent CMV infection. Therefore, we aimed to assess the knowledge of Dutch primary care midwives about CMV transmission and maternal symptoms and the information they provide to pregnant women about CMV infection prevention. A secondary aim was

to assess the reasons for not providing information on CMV infection prevention to pregnant women among primary care midwives in the Netherlands who indicate that they do not provide such information. The findings provide an important starting point for the development of new health policies or educational programs for midwives in order to reduce the burden of congenital CMV infection.

Methods

This is a national cross-sectional study regarding Dutch primary care midwives' knowledge about CMV transmission and maternal symptoms; clinical practice regarding the provision of CMV infection prevention information to clients and any reasons for not informing pregnant women about CMV.

Participants

We obtained addresses of all 519 primary midwifery care practices in the Netherlands through the Royal Dutch Organization of Midwives (KNOV). Of all primary care midwives (n=1910) practicing in the Netherlands, 97.1% are associated with the KNOV (18).

Between September and November 2011, we asked each of the 519 practices to select a midwife at their practice to participate in the study. We sent a questionnaire regarding preventable infectious diseases, including CMV infection, to all practices, accompanied by a cover letter with information about the study and a postage paid return envelope. Because the questionnaire contained questions about midwifery care practice policies, only one midwife per practice was invited to complete the questionnaire. Four weeks after the initial invitation, we sent a reminder to all non-responding practices. We excluded questionnaires with missing answers to all questions about CMV.

Data collection

We developed a self-administered questionnaire based on previous studies and the literature (17, 19). The questionnaire included topics on demographic and professional characteristics, knowledge on CMV transmission and maternal symptoms, sources of knowledge information, information provision and reasons for not informing pregnant women about CMV if applicable. Demographic and professional characteristics of the midwives included gender, age, ethnic origin, school graduation, years of work experience, type of practice (solo practice, duo practice or group practice), and

whether the practice location was rural, urban or highly urban. Thirteen questions covered midwives' knowledge about CMV transmission and maternal symptoms of infection in pregnant women. We asked midwives to indicate which transmission routes and maternal symptoms were 'true', 'false' or whether they 'did not know'. We presented midwives with a list of seven transmission routes for CMV infections of which two were false and with six maternal symptoms of CMV infection of which three were false. We collected data on information pertaining to CMV that they provided to clients by asking midwives how often they inform pregnant women about CMV infection prevention ('always', 'usually', 'sometimes', or 'never'). If midwives indicated that they 'always', 'usually' or 'sometimes' give information, they could choose from a list which prevention methods they provided and whether the information was verbal or written. In addition, if midwives indicated that they did 'usually', 'sometimes' or 'never' give information on CMV infection prevention, they could state their reasons for not providing information by a semi-structured question. Three answering possibilities were given: not enough time; not sure about preventive strategies; and CMV is a rare disease. There was an open space where midwives could report other reasons and they could give multiple answers.

Data analysis

We calculated frequency distributions for questionnaire items on sources of information, knowledge, informing practices and reasons for not informing pregnant women about CMV infection prevention. Sum scores were calculated for the knowledge scores. Each correctly identified transmission route or maternal symptom contributed to the knowledge score (one point for each correct answer). The knowledge score could therefore vary between zero and seven for CMV transmission routes; and between zero and six for maternal symptoms of CMV. For analyses, we dichotomised the midwives' number of years of work experience according to the median value. We categorised the midwives' age into ≤ 24 years, 25–39 years, 40–54 years or ≥ 55 years; and practice location into rural (< 1000 addresses per squared kilometre), urban (1000–2499 addresses per squared kilometre) or highly urban (≥ 2500 addresses per squared kilometre). Ethnic origin was defined according to the classification of Statistics Netherlands, and categorised into Dutch origin, other western origin or non-western origin. We used non-parametric tests, Mann–Whitney U test and Kruskal–Wallis test, to test for differences in median knowledge scores between subgroups of midwives based on their demographic and professional characteristics, because knowledge scores were not normally distributed. We

considered p-values <0.05 as statistically significant and used the statistical software package SPSS 20.0 (SPSS Inc., Chicago, IL) for all analyses.

Findings

In total 345 midwives from 519 midwifery practices returned the questionnaire. Data from 15 midwives were excluded: six midwives did not practice midwifery anymore, one was a student at the time of enrolment and eight midwives did not complete the questions about CMV. We included the data of the remaining 330 midwives in the analyses, representing a net response rate of 63.6%.

Demographic and professional characteristics

The median age of the midwives was 34 years (range of 21–65 years). The majority of midwives graduated in the Netherlands (83.5%), worked in urban areas (48.5%) and in a group practice (71.6%). They practiced up to 41 years with a median experience of eight years (range 0–41 years). Detailed information on demographic and professional characteristics can be found in Table 1.

Knowledge on CMV infection transmission routes and maternal symptoms

Midwives reported to getting their knowledge about CMV infections from their academy/school for midwifery they attended (89.6%), the Internet (63.2%), professional literature (58.9%), or from symposia or conferences and scientific papers as a source of information (28.5% and 24.5% respectively). Regarding CMV transmission, 19.4% of the midwives answered all seven items correctly and 5.8% answered none of the items correctly; the median knowledge score was 4.0 out of a maximum possible score of 7.0 (25th percentile 3.0, 75th percentile 6.0). Table 2 shows the number of correct and false answers per item.

A majority of the midwives knew that CMV infection can be transmitted through kissing (saliva) (81.9%) and through diaper change (urine) (74.3%). However, only 45.2% of the midwives knew CMV infection can be transmitted through breast milk. In total, 37.8% of the midwives incorrectly indicated that CMV infection could be transmitted through the air. Regarding maternal symptoms of CMV infection, 11.5% of the midwives correctly identified all six items and 3.9% answered none of the items correctly; the median knowledge score was 3.0 out of a maximum possible score of 6.0 (25th percentile 2.0, 75th percentile 5.0). Most midwives knew that maternal CMV infection may cause fever (91.2%) or that it may not cause any symptoms (86.2%).

Table 1. Demographic and professional characteristics of participating midwives and of Dutch primary care midwives (18)

	N=330 ^a (%)	Dutch primary midwifery care population N=1910 (18) (%)
Gender		
Male	6 (1.8)	No information available
Female	322 (98.2)	
Age		
≤ 24 years	34 (10.6)	164 (8.6)
25 – 39 years	173 (54.1)	1,069 (56.0)
40 – 54 years	92 (28.7)	539 (28.2)
≥ 55 years	21 (6.6)	136 (7.2)
Ethnic-origin		
Dutch origin	286 (87.7)	No information available
Western origin	25 (7.7)	
Non-Western origin	15 (4.6)	
Work experience		
≤ 8 years	165 (50.6)	No information available
≥ 9 years	161 (49.4)	
Place of graduation		
The Netherlands	273 (83.5)	1,634 (85.7)
Abroad	54 (16.5)	273 (14.3)
Practice location		
Rural	108 (32.7)	173 (33.3)
Urban	160 (48.5)	249 (48.0)
Highly urban	62 (18.8)	97 (18.7)
Type of practice		
Solo	32 (9.8)	86 (16.6)
Dual	61 (18.7)	122 (23.5)
Group	234 (71.6)	311 (59.9)

^a Denominator varies due to missing values (between 0 and 10 missing values per item).

Midwives were unsure about the false statements regarding maternal symptoms, as many midwives did not know CMV infection would not cause maternal cardiac problems (47.8%), maternal visual problems (46.1%), or maternal thrombosis (54.4%). The overall median knowledge score was 8.0 out of a maximum possible score of 13.0 (25th percentile 6.0, 75th percentile 10.0). In total, five (1.5%) midwives answered none of the questions correctly and 17 (5.2%) midwives answered all 13 questions correctly. We found no significant differences in median knowledge scores between subgroups of midwives.

Information provision on CMV infection prevention

In total, 10.6% (n=35) of the midwives reported 'always', 11.6% (n=38) 'usually', 36.8% (n=121) 'sometimes', and 41.0% (n=135) reported 'never' providing information

Table 2. Midwives knowledge concerning transmission routes and symptoms of cytomegalovirus (CMV) infection; N=330^a

	Correct answer (%)	False answer (%)	Don't know (%)
Transmission routes			
<i>True statements</i>			
Kissing (saliva)	267 (81.9)	31 (9.5)	28 (8.6)
Changing diapers (urine)	243 (74.3)	36 (11.0)	48 (14.7)
Blood contact	201 (61.5)	72 (22.0)	54 (16.5)
Sexual intercourse	179 (54.6)	91 (27.7)	58 (17.7)
Breast milk	147 (45.2)	76 (23.4)	102 (31.4)
<i>False statements</i>			
Direct skin contact	205 (62.5)	71 (21.6)	52 (15.9)
Air transmission	166 (51.1)	123 (37.8)	36 (11.1)
Symptoms in pregnant women			
<i>True statements</i>			
Fever, and not feeling well	299 (91.2)	10 (3.0)	19 (5.8)
No symptoms	281 (86.2)	10 (3.1)	35 (10.7)
Elevated liver enzymes	131 (40.2)	53 (16.3)	142 (43.6)
<i>False statements</i>			
Cardiac problems	156 (48.1)	13 (4.0)	155 (47.8)
Visual problems	142 (44.0)	32 (9.9)	149 (46.1)
Thrombosis	140 (42.8)	9 (2.8)	178 (54.4)

^a Numbers may not add up to 330 due to missing values (between 2 and 7 missing values per item).

to pregnant women about CMV infection prevention. Table 3 shows detailed information of the 194 midwives who reported to 'always', 'usually' or 'sometimes' provide information about CMV infection prevention to pregnant women. The recommendation of hand washing after diaper change was provided most frequently, either verbally (65.4%) or written (20.4%). The majority of midwives reported never providing information about not sharing cups with young children (64.9%), not sharing utensils with young children (64.4%), or not sharing toothbrushes with young children (71.7%).

Table 4 shows the reasons for not providing CMV infection prevention information of the 294 midwives who reported providing 'usually', 'sometimes' or 'never' information. The most commonly reported reasons for not informing women about CMV infection prevention were lack of knowledge about the risk factors or prevention methods (45.7%); the perception that CMV is a rare disease in pregnant women (27.3%); only providing information to women who are at increased risk (15.9%); and not enough time (12.1%).

Table 3. Details of information provision about the various methods to prevent cytomegalovirus (CMV) infection among midwives who indicated 'always', 'usually' or 'sometimes' providing information to their clients; N=194.

Preventive method	Verbal (%)	Written (%)	No information (%)
Washing hands with after diaper change	125 (65.4)	39 (20.4)	58 (30.4)
Not sharing cups with young children	60 (31.4)	18 (9.4)	124 (64.9)
Not sharing utensils with young children	64 (33.5)	17 (8.9)	123 (64.4)
Not sharing a toothbrush with young children	50 (26.2)	13 (6.8)	137 (71.7)

Values add up $\geq 100\%$ because multiple answers were possible.

Table 4. Reasons for not informing pregnant women about methods to prevent cytomegalovirus (CMV) infection among midwives who indicated to 'usually', 'sometimes' or 'never' providing information to their clients; N=294

Reasons for not or not always providing information	N (%)
Lack of knowledge about preventive methods or risk factors	132 (45.7)
Maternal CMV infection is rare	79 (27.3)
Only to women who are at increased risk for infection	46 (15.9)
Not enough time	35 (12.1)
Never think about doing it	10 (3.5)
Prevention is difficult or not possible	9 (3.1)
Never learned this during midwifery training	8 (2.8)
Is not included in standardized talk of infectious diseases	6 (2.1)
Not want to make pregnant women anxious	6 (2.1)
Maternal infection rate and foetal transmission is not common	5 (1.7)
Only to pregnant women who ask about CMV infection	2 (0.7)
Pregnant women already know CMV infection prevention methods	2 (0.7)
Pregnant women can not remember that much information	1 (0.3)

Values add up $\geq 100\%$ because multiple answers were possible.

Other reasons provided through the open ended question were: because they never thought about doing it (3.5%); they think prevention is difficult or not possible (3.1%); they never learned it during their midwifery training (2.8%); or because they do not want to make pregnant women anxious (2.1%).

Discussion

This study indicates that the majority of midwives did not have comprehensive knowledge about transmission routes and maternal symptoms of CMV infection, and often provided no information on CMV infection prevention to pregnant women. Of the midwives (194/330) who reported 'always', 'usually' or 'some-times' providing pregnant women with information on CMV infection prevention, more than half

reported never informing pregnant women about not sharing cups, utensils or toothbrushes with young children. The main reasons for not informing pregnant women for CMV infection prevention were lack of knowledge about preventive methods and risk factors and the assumption that maternal CMV infection is a rare disease.

Few studies have assessed the knowledge of transmission routes and maternal symptoms of CMV infection among antenatal care providers and to our knowledge no study assessed reasons for not informing pregnant women about methods to prevent CMV infection (17, 20). Midwives participating in our study had slightly more knowledge concerning CMV topics compared to previous studies (17, 20). However, this study still confirms a gap between knowledge on CMV transmission and maternal symptoms and the burden of disease. Most CMV infections occur through contact with urine or saliva of infected children or through sexual contact (21). However, a substantial number of the responding midwives were not aware of these transmission routes of CMV infection. In addition, it is surprising that midwives had some knowledge about saliva as a transmission route for CMV infection, but this knowledge did not appear to be generalised to other bodily fluids as evidenced by lower knowledge scores on items concerning urine and breast milk as CMV transmission routes. This may indicate that Dutch primary care midwives lack the underlying understanding about infectious disease transmission routes.

Close to 50% of the midwives acknowledged that they do not have comprehensive knowledge about CMV transmission as they indicated this lack of knowledge as the main reason for not informing pregnant women. Other main reasons for not providing information to pregnant women included that maternal CMV infection is rare; that they (midwives) never think about providing information about CMV infection prevention; or that they never learned to do it during midwifery training. These responses demonstrate that our study participants lack an appreciation for the significance of CMV transmission during pregnancy and neonatal period even though the estimated birth prevalence of 0.54% for congenital CMV infection is similar to that as Down syndrome (2, 4, 22). In the Netherlands approximately 1000 infants are infected with congenital CMV infection annually, and approximately 180 of them develop long term effects, including hearing loss and cognitive or motor deficits (2). Our study strongly suggests that more educational training on CMV infection is necessary for primary care midwives. This study revealed low levels of midwives providing information about CMV infection prevention to all pregnant women, which is consistent with a previous study among gynaecologists and obstetricians (11). At

this moment no randomised control trial has evaluated antenatal interventions to prevent maternal CMV infection to the foetus (23). However, other research suggests that proper educational interventions about hygienic behaviour have the potential to be a feasible strategy to prevent maternal CMV infection (5-10). Our study identifies that midwives in the Netherlands are missing an opportunity to prevent CMV infection among their clients. Further, preventive practices are assumed to be effective only if health care professionals inform their clients properly and we identified a gap in knowledge among midwives in the Netherlands regarding accurate CMV information (17).

A strength of this study is its relatively high response rate and the representativeness of our study population. Background and professional characteristics of the midwives participating in our study were consistent with the overall population of midwives working in the Netherlands, regarding age, place of graduation and practice location, with the exception of the type of practice; participating midwives were more likely to work in a group practice than in a solo practice (16, 18). However, we found no association between practice type and the median knowledge score for transmission routes or maternal symptoms of CMV infection. A study limitation is that by inviting only one midwife per midwifery practice, it is possible that the one who was most interested and had the most knowledge concerning CMV infections completed the questionnaire. This may have led to an overestimation of the knowledge about CMV. Both these limitations suggest that the knowledge and information provision on CMV infection prevention in reality may be lower than suggested in this study. In addition, 16% of the midwives indicated to only inform pregnant women about CMV infection prevention who are at increased risk for CMV infection. However, our study did not reveal insight into whether midwives are aware that the main risk factors for CMV infection are having preschool children in the household who attend a day care setting and working in a paediatric setting or in a day care setting (8, 24).

The knowledge gap identified in our study suggests that Dutch midwives need to be further educated on CMV infection and CMV prevention strategies. If midwives do not inform pregnant women about CMV infection prevention, pregnant women's awareness will not be raised and the burden of congenital CMV will not decrease (17). In order to improve knowledge of midwives, we recommend the following. First, the current midwifery educational curriculum needs to be reviewed and updated with information on CMV infection and prevention strategies. Second, practicing midwives need to update their knowledge on CMV infection and prevention, and need to incorporate this in the health education they provide for pregnant women.

Third, we recommend that Public Health Organisations and other organisations involved in mother and childcare develop standardised educational materials on CMV infection and prevention. Developed leaflets could be distributed through midwifery practices. Finally, we strongly recommend that midwives, after reading this or similar publications, immediately start providing information about hand washing and other preventive measures to pregnant women in order to reduce the burden of CMV infection.

Conclusion

Congenital CMV infection is an important public health problem among pregnant women and their new-born infants. Many primary care midwives have limited knowledge of this viral infection, including routes of transmission, and maternal symptoms and prevention approaches. Midwives in this study often did not provide information on CMV infection prevention because they lack knowledge regarding the disease. Maternal CMV infection can be reduced by modifying behaviour of pregnant women and this study clearly identified a need for improvement in providing education to pregnant women about preventive strategies.

Conflict of interest

We declare that none of the authors has any conflict of interest performing this study.

Acknowledgements

We would like to acknowledge the primary care midwives who participated in this study. The Academy of Midwifery Amsterdam & Groningen (AVAG), the Netherlands, funded this study.

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